

"APPROVED FOR RELEASE: 06/13/2000

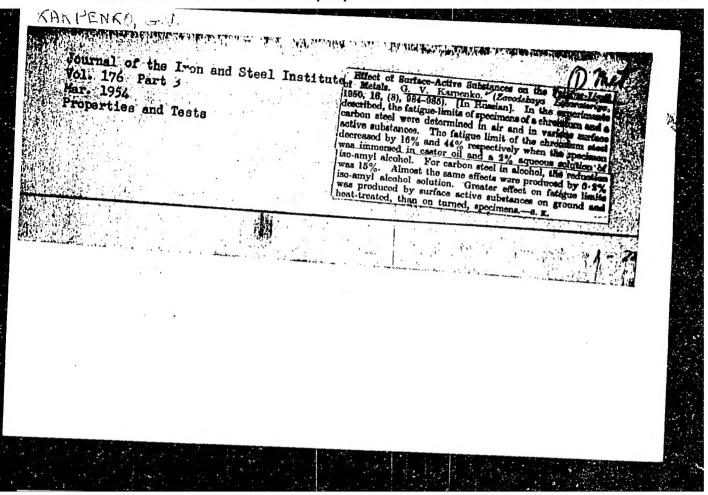
CIA-RDP86-00513R000720820009-3

USSR/Academy of Sciences - Ukrainian SSR Mar 50

"In Presidium of the Academy of Sciences of the Ukrainian SSR," G. V. Karpenko

"Visnyk Ak Nauk Ukrains'koy RSR" No 3, pp 74-76

Evaluates 1949 sci activity on basis of reports delivered to Presidium of Acad Sci Ukrainian SSR by Sec of Physicomath, Chem, Agr, and Social Sci. Numbers of sci reports, publications, lectures and consultations are given.

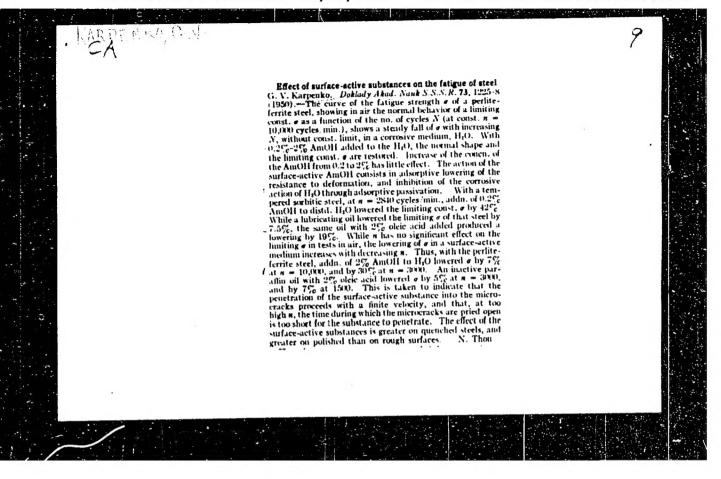


KARPENKO, G. V.

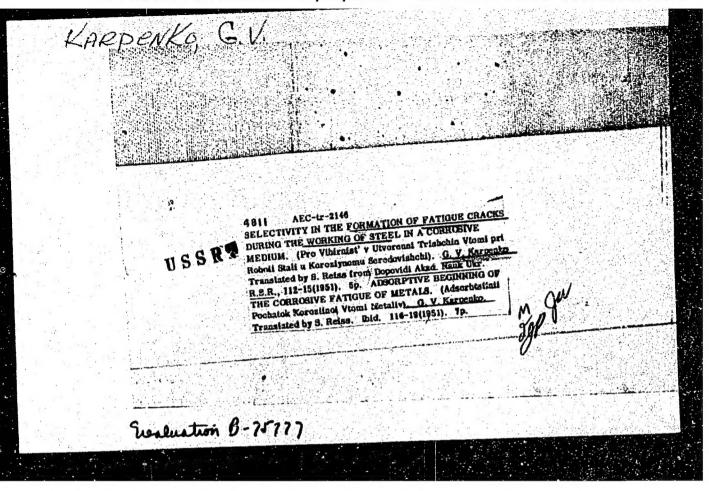
Academy of Sciences of the Ukrainian S.S.R.

Presidium of the Academy of Sciences of the Ukrainian S.S.R. during September Visnyk AN URSU 22 No. 10, Oct. 1950

Monthly List of Russian Accessions, Library of Congress, August, 1952. UNCLASSIFIED.



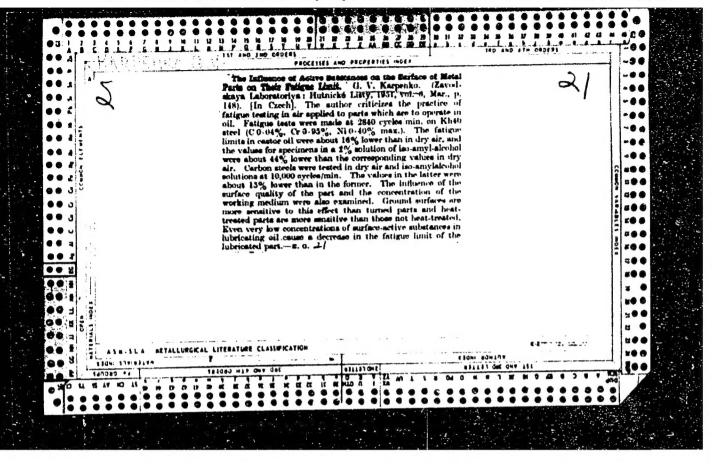
RAPPENKO C V	PA 174T39
KARPENKO, G. V.	USSR/Metals - Steel, Physical 1 Sep 50 Chemistry of "Concerning the Problem of the Formation of Microcracks From Fatigue," G. V. Karpenko, Inst of Constr Mech, Acad Sci USSR "Dok Ak Mauk SSSR" Vol LXXIV, No 1, pp 95-98 Surface energy of solid, and distribution over surface influence appearance of slips which precede formation of fatigue cracks. Shows varied processing of solid, establish- ing surface ultramicrogeom, causes varied 174739 USSR/Metals - Steel, Physical Chemistry of Conditions for formation of fatigue micro- cracks and for effect of surface-active sub- stances on this process. Submitted by Acad P. A. Rebinder.

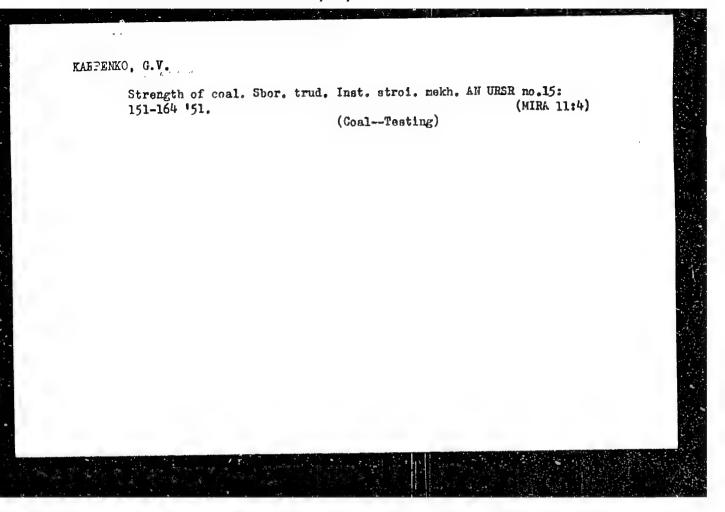


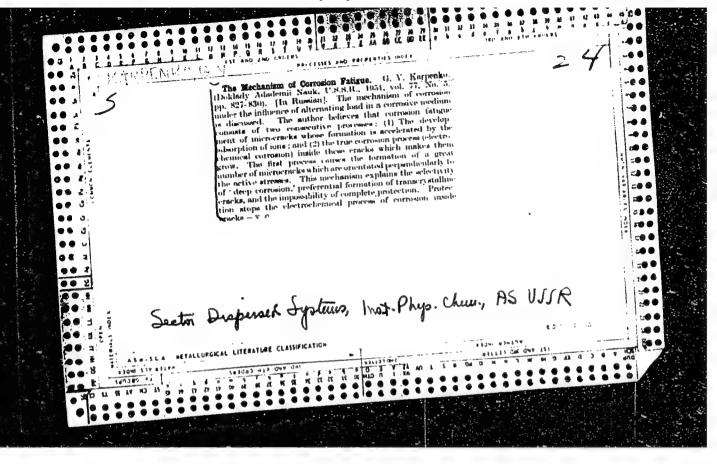
KARPENKO, G. V.

"Adsorption as the Origin of Corrosion Fatigue of Metals," Dop. Ak Nauk URSR, No 2, pp 116-119, 1951

B-75777







KARPENKO, G. V.

USSR/Metals - Steel, Corrosion

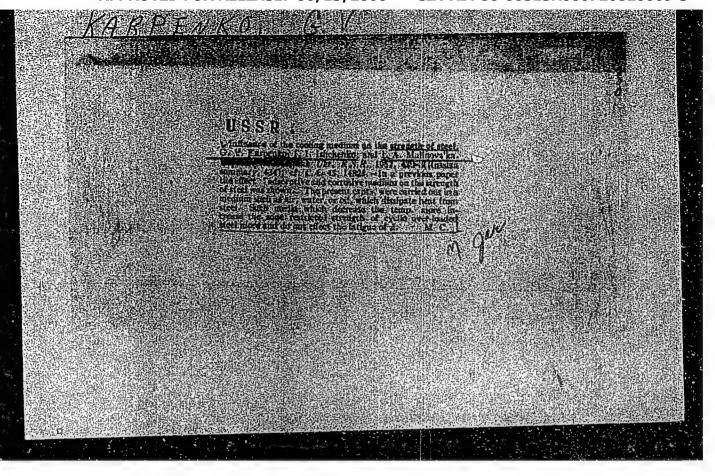
11 Jul 51

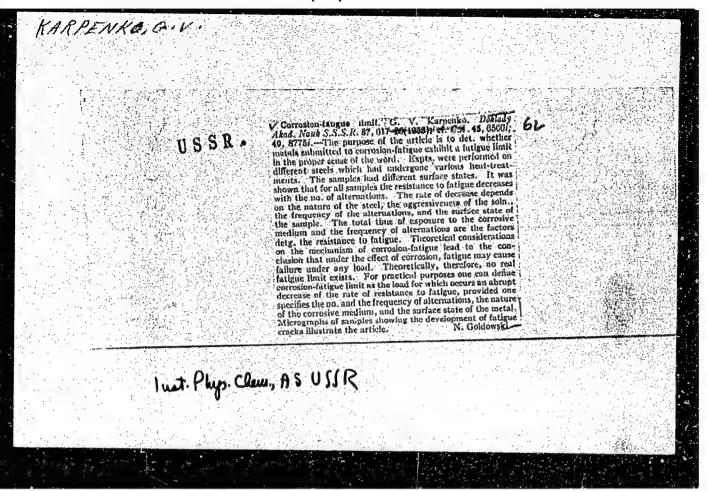
"Concerning Corrosion Fatigue," G. V. Karpenko, Inst of Phys Chem, Acad Sci USSR

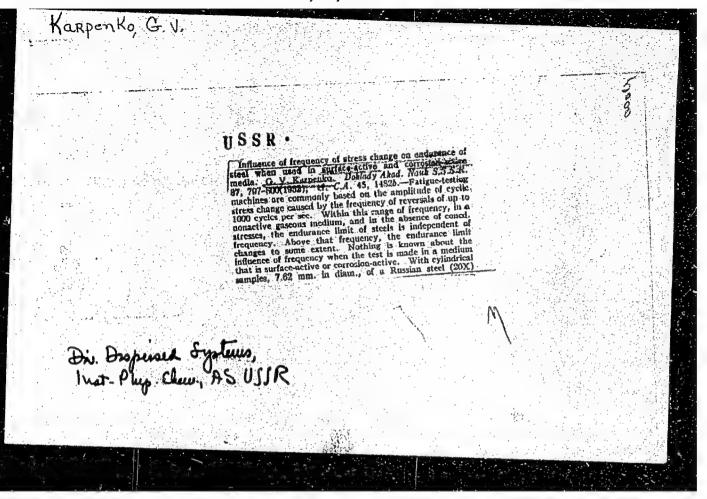
"Dok Ak Nauk SSSR" Vol LXXIX, No 2, pp 287, 288

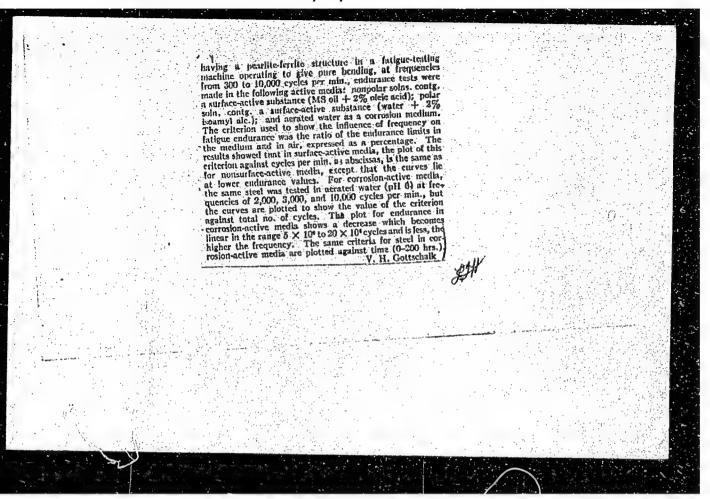
Gives addnl exptl data on mechanism of corrosion fatigue supplementing previous paper published in "Dok Ak Nauk SSSR." Vol IXXVII, No 5, 1951. Emphasis was made on investigation of adsorption effect in process of corrosion fatigue, using 1% aq soln of saponin as corrosive medium. Specimens with zinc protectors were employed in tests. Submitted by Acad P. A. Rebinder 7 May 51.

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"APPROVED FOR RELEASE: 06/13/2000

CIA-RDP86-00513R000720820009-3

KARPENKO, C.V.

Qualitative modifications in steel subjected to "adsorption"- and corresion attigue processes. Nauch.zap. IMA L'viv.fil AN URSR 2 no.1:64-83 '53.

(Steel--Fatigue)

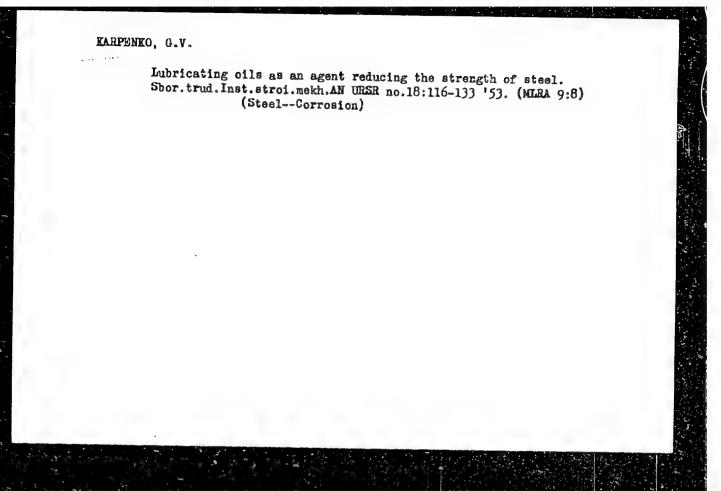
(Steel--Fatigue)

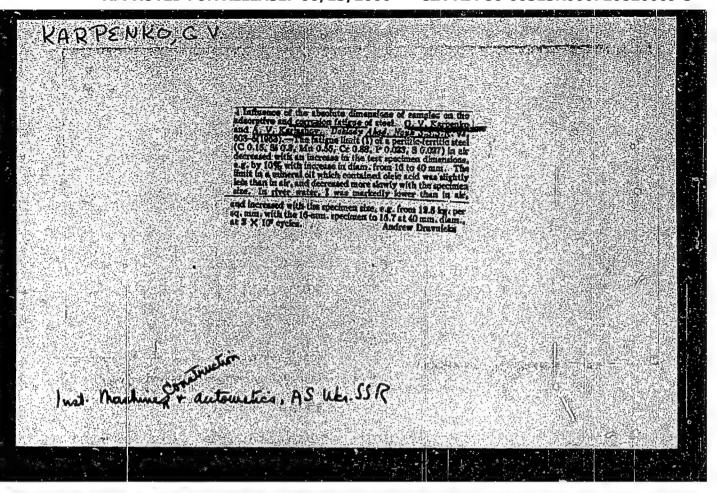
KARPENKO,G.V.; ISHCHENKO,I.I.

Residual compression stresses as a method of controlling "adsorption" and corrosion fatigue in steel. Nauch.zap. IMA L'viv AN URSR 2 no.1: 84-93 '53.

(Steel--Fatigue) (Strains and stresses)

(Steel--Fatigue) (Strains and stresses)





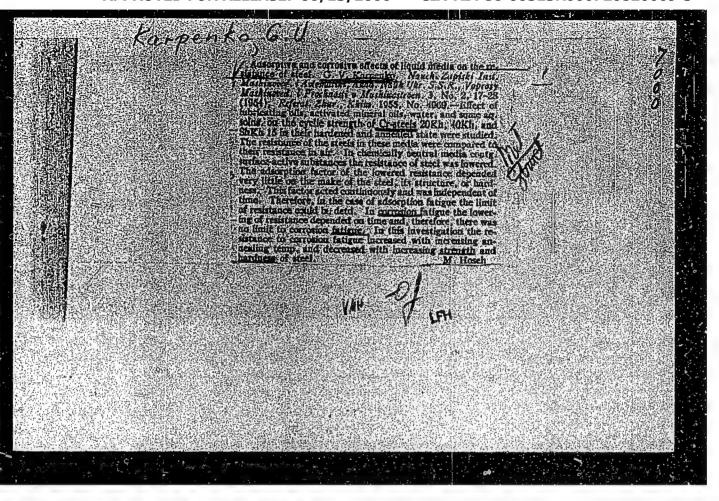
LIKHTMAN, V.I.; REEINDER, P.A.; KARPENKO, G.V.; YEGOROV, N.G., redaktor;

NEVRATEVA, N.A., tekmichestry redaktor

[Effect of a surface-active medium on processes of metal deformation]

Vlitanie poverkhnostno-aktivnoi sredy na protsensy deformatsii metallov, Moskva, Izd-vo Akademii nauk SSER, 1954. 206 p. (MIRA 8:4)

(Deformation (Mechanics)) (Metals)



KARPENKO,G.V.

Mechanism of "adsorption" fatigue in metals. Nauch.zap. IMA L'viv
fil. AN URSR. Ser. masm. 3 no.2:29-39 '54.

(Steel--Fatigue)

KARPENKO, G.V.

Training scientific workers in the Institute of Mechanical Engineering and Automatic Control of the Lvov branch of the Academy of Sciences of the Ukrainian S.S.R. Visnyk AN URSR 25 no.10:65-67 0 154. (MLRA 8:1)

1. Direktor Institutu mashinoznavstva i avtomatiki AN Ursr. (Ukraine--Technical education)

"APPROVED FOR RELEASE: 06/13/2000

CIA-RDP86-00513R000720820009-3

KARPENKO, G.V.

USSR/ Physics

Techn. Physics

Card

1/1

Authors

: Karpenko, G. V.

Title

Effect of surface-active substances on the damping decrement of oscillations in steel

Periodical

Dokl. AN SSSR, 97, Ed. 1, 81 - 83, July 1954

Abstract

The effect of surface-active substances on the oscillation-damping process was explained by testing a ShKh-15 steel sample in a Malashenko fatigue-testing machine. The results obtained are explained by the changes in oscillation characteristics in the tested article. Seven USSR references. Table, graph.

Institution :

Acad. of Sc. Ukr-SSR, Institute of Machine Construction and Automatics,

Lvov.

Presented by : Academician, P. A. Rebinder, April 2, 1954

KARPENKO, G.V., doktor tekhnicheskikh nauk, professor, redaktor; SAVIN.Q.N. redaktor; LOPATINSKIY, Ya.B., redaktor; LECNOV, M.Ya., doktor fiziko-matematicheskikh nauk, redaktor; MIKHYLOVSKIY, V.N., kandidat tekhnicheskikh nauk, redaktor; PARASYUK, O.S., kandidat fiziko-matematicheskikh nauk, redaktor; PANASYUK, V.V., kandidat fiziko-matematicheskikh nauk, redaktor; ZIL'BAN.M.S., redaktor; RAKHLINA, N.P., tekhnicheskiy redaktor

[Some problems in the fatigue of steel with calculation of the influence of active agents] Hekotorye voprosy ustalostnoi prochnosti stali suchetom vliianiia aktivnoi sredy. Kiev, Izd-vo Akademii nauk USSR, 1955.
48 p. (MIRA 9:3)

1. Akademiya nauk URSR, Kiyev. Institut mashinoznavstva i avtomatiki.

2. Deystvitel'nyy chlen AN USSR (for Savin) 3. Chlen-korrespondent

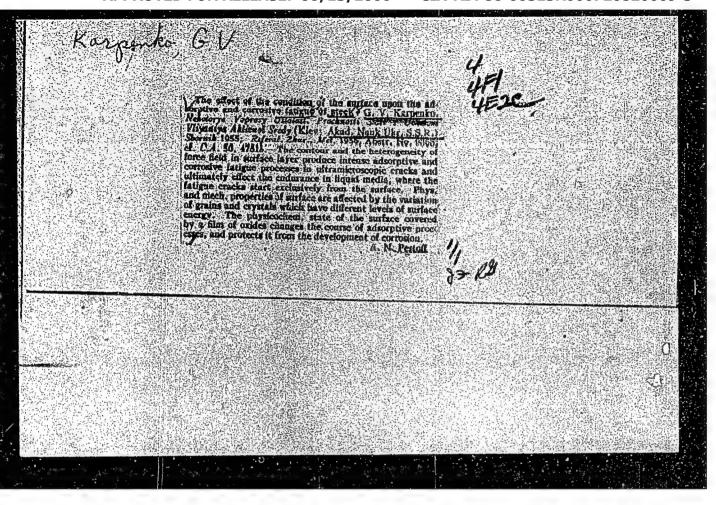
AN USSR (for Lopatinskiy) (Steel--Fatigue)

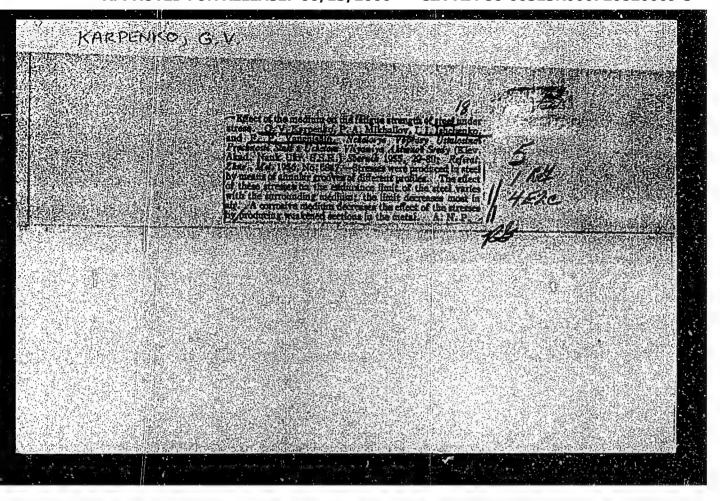
KARPENKO, Georgiy Vladimirovich, professor, doktor tekhnicheskikh nauk

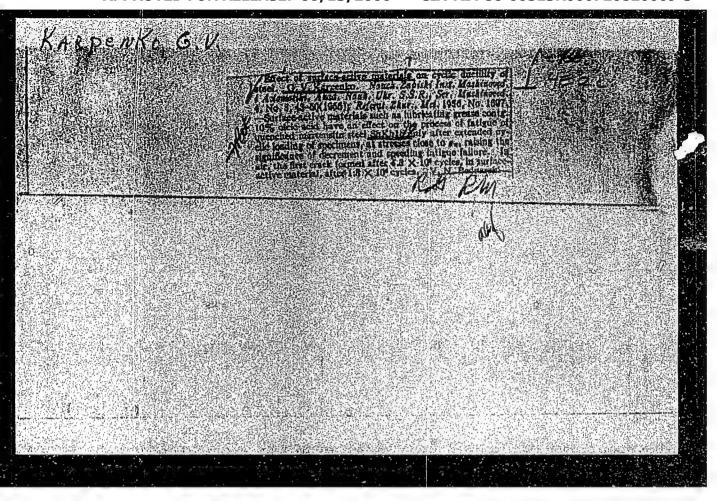
REBINDER, P.A., akademik, redaktor; KAZANTSEV, B.A., redaktor; RAKHLINA,

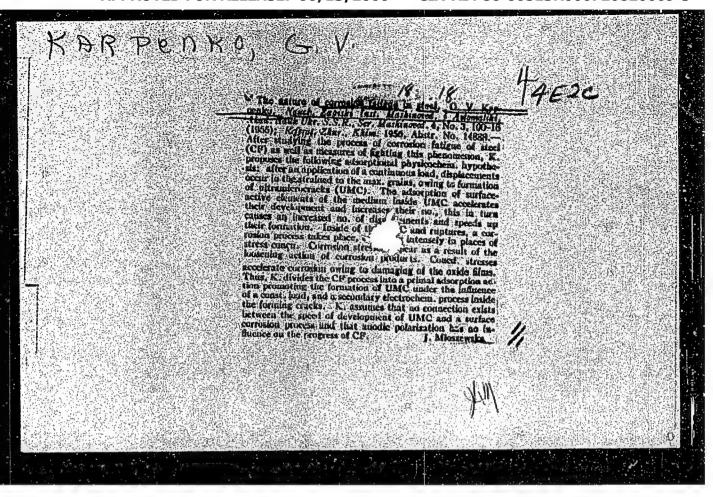
N.P., tekhnicheskiy redaktor

[Effect of active liquid media on the strength of steel] Vliianie aktivnykh zhidkikh sred na vynoslivost' stali. Kiev, Izd-vo Akadenii nauk Ukrainskoi SSR, 1955. 205 p. (MLRA 9:3) (Steel--Testing)









KARPENKO, G.V., MIKHAYLOV, P.A., ISHCHENKO, I.I.

Simultaneous effect on the fatigue strength of steel of concentrated stress and surface active media. Dop. AN URSR no.5: 444-447 155. (MIRA 9:3)

1. Institut mashinoznavstva ta avtomatiki AN URSR. Predstaviv diysniy chlen AN URSR G.M. Savin. (Steel--Fatigue)(Klasticity)

KARPENKO, G.V.; YANCHISHIN, F.P.

On the simultaneous effect of corrosive agents and stress concentration on steel strength. Dop.AN URSR no.6:525-528 155. (MLRA 9:7)

1.Institut mashinoznavstva ta avtomatiki AN URSR. Predstaviv diysniy chlen AN URSR G.M.Savin.
(Steel--Testing)

KARPENKO, G.V. KARPENKO, G.V. In the Institute of Mechanical Engineering and Automatics of the Academy of Sciences of the Ukrainian S.S.R. Visnyk AN URSR 26 no.1:69-70 Ja '55. (MERA 8:3) (Mechanical engineering) (Automatic control)

KARPENKO, G.V., doktor tekhnicheskikh nauk, professor.

Greative cooperation with production. Visnyk AN URSE 26 no.7: 71-73 J1'55. (MIRA 8:10)

1. Direktor Institutu mashinoznavstva ta avtomatiki Akademii nauk URSR.

(Academy of sciences of the Ukrainian SSR.)

KARPENKO,G.V.

Power engineering of the future (based on materials of the International Conference on the Peaceful Use of Atomic Energy). Visnyk AN URSR 26 no.9: 52-55. S'55. (MIRA 8:11)

(Atomic power)

Utilization of atomic energy for indutrial purposes. Tr. from the Russian. p. 4. Vol. 7, no. 3/4, Mar./Apr. 1956. ELEXTRONENERGIIA. Sofiya.

SOURCE: East European Accessions List. (EEAL) Library of Congress.

Vol. 5, No. 8, August 1956.

Effect of power cutting on steel endurance. Vest.mash. 36 no.10: 32-34 0 '56. (MERA 9:11)

(Steel--Testing) (Metal cutting)

\$/123/59/000/09/01/036 A002/A001

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1959, No. 9, pp.11-12, # 32853

AUTHOR:

Karpenko, G. V.

TITLE:

On the Universality of the Adsorption Effect in Metal Strength

PERIODICAL: V sb.: Issled. po fiz. tverdogo tela, Moscow, AN SSSR, 1957,

pp. 273-278

TEXT: As a result of the adsorption interaction between am external medium and a metal under strain, the resistance of the metal to deformation and breakdown decreases, the yield limit of single crystals is reduced, and the creep rate increases. The adsorption of surface-active elements from the surrounding medium on the surface of steel causes a decrease of the fatigue strength of the latter. The presence of a variety of imperfections mainly ultramicroscopic ones, usually concentrated in areas which are regarded as weakspots in crystallo-chemical respect, is of special importance for the inter-

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S/123/59/000/09/01/036 A002/A001

On the Universality of the Adsorption Effect in Metal Strength Reduction

action of a metal under strain and the external medium.

Translator's note: This is the full translation of the original Russian abstract.

B. A. M.

B

Card 2/2

KARPENKO, G.V.; YATSYUK, A.I.

Effect of mechanical processing of steel on its fatigue strength. [with summary in English]. Dop. AN URSR no.1:23-26 '57. (MLRA 10:4)

1. Institut mashinoznavstva i avtomatiki AN URSR. Predstaviv akademik AN URSR G. M. Savin. (Steel-Fatigue)

Destruction of metals in contact with liquid metals [with summary in English]. Prykl. mekh. 3 no.1:13-19 '57. (MLRA 10:5)

1. Institut mashinoznavstva ta avtomatiki AN UESR. (Mercury--Metallurgy) (Duralumin--Metallurgy)

(Brass--Netallurgy)

SOV/137-57-10-20349

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 10, p 278 (USSR)

AUTHORS: Karpenko, G.V., Yatsyuk, A.I., Yanchishin, F.P.

TITLE: Influence of Mercury Upon the Strength and Fatigue Strength of

Structural Materials (Vliyaniye rtuti na prochnost' i vynoslivost'

konstruktsionnykh materialov)

PERIODICAL: Nauchn. zap. In-ta mashinoved. i avtomatiki. AN UkrSSR, 1957,

Vol 6, pp 42-49

ABSTRACT: An investigation is made of the influence of Hg (amalgamation)

upon the mechanical properties of steel, brass, and duralumin. It is found by tensile testing that liquid Hg significantly reduces the σ_b of specimens of brass (by 32%), while that of duralumin drops by 12%, and the δ of brass and duralumin drops to 0. Liquid Hg has no influence whatever upon polished 20Kh steel and red copper. Fatigue strength is considerably reduced in testing by cyclic loading. Surface rolling of the specimens results in a considerable increase in their

fatigue strength both in Hg and in air. The authors hold that the decline in mechanical properties is due to the penetration of the Hg,

Card 1/2 via a system of defects, into specimens that have not had surface

SOV/137-57-10-20349

Influence of Mercury Upon the Strength (cont.)

rolling. The Rebinder adsorptive-cleavage effect makes it appearance under these conditions. Surface rolling closes all the surface defects, and this renders the metal insusceptible to the action of Hg.

P.N.

Card 2/2

KARPENKO OV.

AUTHOR: Karpenko, G.V., Doctor of Technical Sciences, Professor, and Tynnyy, A.N., Babey, Yu.I., Engineers. 122-2-13/23

TITIE: On the depth of the sulphur-enriched layer in the sulphiding of steel and cast iron (O glubine sloya, obogashchennogo seroy pri sul'fidirovanii stali i chuguna)

PERIODICAL: "Vestnik Mashinostroyeniya" (Engineering Journal), 1957, No. 2, pp. 61 - 62 (U.S.S.R.)

ABSTRACT: Medium temperature (540 - 570 C) sulphiding in a solid, liquid or gas medium has been claimed by the Minsk Motorcar Plant (Minskiy Avtozavod) to produce sulphur diffusion to a depth of up to 0.3 mm and to yield a better wear resistance in tools and machine components. These claims were examined by the use of the radio-active S35 having a beta radiation of 0.17 MeV. The test technique is described. 0.0021% of radio-active FeS was added to the FeS in the sulphiding bath (containing 13.2% FeS). The tests show sulphur penetration to a depth of 16 μ in steel and 30 μ in cast iron. The wear resistance due to the anti-friction and anti-seizure properties of sulphur is restricted to this thin layer.

Card 1/1 There are 2 figures, including 1 graph and 4 Slavic references.

AVAILABLE: Library of Congress

AUTHOR:

KARPENKO, G. V.

PA - 2768

TITLE:

Role of the Hydrogen Absorption in the Corrosion Fatigue of Steel. (Rol' navodorazhivaniya pri korrozionnoy ustalosti stali, Russian)

PERIODICAL:

Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 4, pp 850-852 (U.S.S.R.)

Received: 6 / 1957

Reviewed: 7 / 1957

ABSTRACT:

In previous works the author developed absorption-electrochemical conceptions on the corrosion fatigue of steel. The present paper investigates this kind of fatigue of steel in the case of high stress amplitudes. In the case of simultaneously acting and repeatedly changing stresses absorption-, diffusion-, and corrosion phenomena occur in the metal, which are discussed in detail. Atomic hydrogen, which is reduced on metal, diffuses into the metal lattice, saturates it (on which occasion hydrides may be formed), and causes hydrogen brittleness. In the case of the metal deformation and hydrogen contamination of sufficiently deep domains of metal, hydrogen penetrates into the depths along the surfaces of the shift with great rapidity. On the occasion of the tests carried out samples of soft steel formed cathodes and anodes in acid electrolyte and were at the same time stretched on a tensile-testing machine for 1-2 minutes up to breaking point. This led to the brittle destruction of the cathode of plaztic steel along the surfaces of displacement (illustration 1 a), on which occasion strength was reduced by about 10%, while the real stresses were reduced by about the double. The anodes did not change at all

Ca.rd 1/2

Role of the Hydrogen Absorption in the Corrosion Fatigue of Steel.

and were torn in exactly the same manner as in the air. Also in the case of a copper anode and a steel cathode, when no hydrogen was deposited on the latter, the aforementioned phenomena were not observed. The great rapidity of saturation with hydrogen was astonishing. The experiments carried out by the author lead one to suppose that in the case of such polycrystalline metals like steel, which have a great number of micro-cathode and micro-anode points on the boundary between the metal and the milieu, the saturation of cathode points with hydrogen takes place very rapidly under the given conditions. (1 Illustration and 4 Citations from Slav Publications).

ASSOCIATION:

Institute for Machine Science and Automatics of the Academy of Science of the Ukrainian SSR, Lemberg

PRESENTED BY: SUBMITTED:

P.A.REBINDER, member of the Academy

SUBMITTED: AVAILABLE: 18.10.1956

Library of Congress

Card 2/2

KARPENKO, Georgiy Vladimirovich; YATSYUK, Arseniy Ivanovich; ISHCHENKO, I.I., kand. tekhn. nauk, vidp. red.; KISINA, I.V., red. vid-vo; SKLYAROVA, V.E., tekhn. red.

[Effect of surface working upon the strength of steel in active liquid media] Vplyv obrobky poverkhni na vtomnu mitsnist' stali v aktyvnykh ridynnykh seredovyshchakh. Kyiv, Vyd-vo Akad. nauk URSR, 1958. 113 p.

(Steel) (Metal cutting)

KALPENKO, C.U.

5(4)

PHASE I BOOK EXPLOITATION

sov/2610

Akademiya nauk Ukrayins koyi RSR. Instytut mashynoznavstva ta avtomatyky

Deyaki pytannya fizyko-khimichnoyi mekhaniky metaliv (Physical, Chemical, and Mechanical Properties of Metals) Kyyiv, 1958. 142 p. 1,000 copies printed.

Resp. Ed.: H.V. Karpenko, Doctor of Technical Sciences; Ed. of Publishing House: V.I. Pechkovs'kyy; Tech. Ed.: V.I. Yurchyshyn.

PURPOSE: The collection is intended for metallurgical engineers desiring information on fatigue and corresion.

COVERAGE: The collection of 15 articles in Ukrainian compiled by 9 authors engaged in fatigue and corresion research, is devoted to the subject of engineering practices in testing the fatigue properties of metals, mainly steel, with a particular emphasis on the phenomenon of corrosion fatigue and the effect of various liquid media upon back fatigue. Methods of investigation are described

Card 1/5

sov/2610 Physical, Chemical, and Mechanical (Cont.) and the results evaluated. The collection is dedicated to the sixtieth anniversary of the Academician Petro Oleksandrovych (Petr Aleksandrovich) Rebinder, an eminent medallingist. The tests were conducted at the instytut budivel novi mekhaniky (Structural Mechanics Institute), Kiyev, Instytut mashynoznavstva ta avormanyay (Machine-building and Automation Institute), Livey, both under the sponsorship of the Ukrainian Academy of Sciences, and at the Politekhrichny; instruct (Polytechnical Institute), Khar'kov. References follow each arbicle. TABLE OF CONTENTS: 3 Introduction Rebinder, P.O. On Physicochemical Mechanics Karpenko, H.V. Effect of Engironment on the Strength 17 of Metals Afendyk, L.H. Deformation Anisotropy of Mechanical Properties of Steel in Certain Nonuniform Processes of Plastic Deformation 23 gard 2/5

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Karpenko, E.V. a Temperature of 4 Corrosion-Fatigu	und F.P. Yanchyshyn. WKH Steel Upon its me Strength	Effect of the Corrosion Resis	Tapping tance and its	83
	. Corrosion Resista	nce of "45" Ste	eel	88
Stepurenko, V.T. sulphuric Soluti	. Corrosion-Fatigue	Strength of "	45" Steel in Hydro-	97
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Yanchyshyn, F.P. Nature of Fatigue of "45" Steel with Stress Raisers	Failure of	Induction-hardend specia	mens 106
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Tynnyy, A.N. Effect of Sulphiding vehicle Plant Method on the Wear	by the MAZ resistance	[Minsk Motor- of Iron and Steel	123
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Card 4/5

Physical, Chemical, and Mechanical : (Cont.)

SOV/2610

Yatsyuk, A.I., V.T. Stepurenko, and F.P. Yanchyshyn, Methods of Investigating the Fatigue Strength of Metals in Aggressive Liquid Media with the NU Testing Machine

140

AVAIIABLE: Library of Congress (TA465.A42)

Card 5/5

TM/gmp 12-22-59

21-1-8/26

AUTHORS:

Karpenko, C.V., and Kripyakevich (Kryp'yakevych), R. I.

TITLE:

On the Effect of Hydrogen on Strained Steel (O deystvii vodo-

roda na deformiruyemuyu stal')

PERIODICAL:

Dopovidi Akademii Nauk Ukrains'koi RSR, 1958, # 1, pp 37-40

(USSR)

ABSTRACT:

The authors carried out experiments for studying an effect of hydrogen in the deformation process of soft steel on its mechanical properties. A special accessory to the IM-12 research tensile machine made it possible to place a steel sample being stretched at a constant rate into an electrolyte and apply a cathode or anode potential to it.

Observations have shown that the samples of steel 3 did not lose their plasticity and did not change other mechanical properties on applying anode potential, although they became covered with thin films of oxides during the experiment. However, on applying cathode potential, the steel samples lost plasticity and broke along the planes of shift. Mechanical properties of the cathode-polarized samples altered considerably, in particular, indices of plasticity and real breakdown stress. The limit of durability and yield point remained practically unaltered independent of the type of electrolyte,

Card 1/2

On the Effect of Hydrogen on Strained Steel

21-1-8/26

anode material and density of current. Experiments have shown that the variation of mechanical properties of the cathode-polarized samples depended primarily upon the density of current and only insignificantly upon the anode material. Results of experiments have been compiled into a table, and the dependence of some properties on the current density is shown by the graphs in Figure 2 of the article. It is concluded that in the process of steel deformation, its saturation with hydrogen occurs along the shift lines during galvanization.

The article contains 1 photo, 1 graph, 1 table and 1

Russian reference.

ASSOCIATION: Institute of Machine Study and Automation (Instytut mashy.no-

znavstva i avtomatyky AN URSR) of the Ukrainian Academy of Sciences

PRESENTED: By Academician of the Ukrainian Academy of Sciences Yu.K.

Delimarskiy (Delimars'kyy)

SUBMITTED: 24 June 1957

AVAILABLE: Library of Congress

Card 2/2 1. Steel-Deformation-Physical factors 2. Steel-Test methods

3. Steel-Test results

KARPENKO, G.V. [Karpenke, H.V.] (L'vev); KRIPYAKEVICH, R.I. [Kryp'iakevych, R.I.] (L'vov)

Effect of the polarization of steel subjected to deformations on its mechanical properties. Prykl. mekh. 4 no.4:376-383 158.

(MIRA 11:12)

1. Institut mashinovedeniya i avtomatiki AN USSR. (Steel--Testing)

AUTHORS: Karpenko, G. V., Kripyakevich, R. I. SûV/20-120-4-38/67

The Influence of the Polarization of Steel on Its Mechanical TITLE:

Properties (Vliyaniye polyarizatsii stali na yeye mekhanicheskiye

svoystva)

Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 4, PERIODICAL:

pp. 827 - 829 (USSR)

ABSTRACT: The authors in various electrolytes investigated the influence

of the polarization of steel on its mechanical properties. A special device in the tensile-testing machine IM - 12 made the disruption of steel samples in an electrolyte possible when these steel samples are anodically or cathodically polarized by external power supplies. Besides, the mechanical properties of steel can be determined in this manner during the process of polarization. The authors examined soft annealed steel-3with a perlite-ferrite structure in order to be able to observe the decrease in plasticity. Aqueous solutions of sulfuric acid, sodium hydroxide, or NaCl served as electrolytes. The current density in polarization varied from 0 to \pm 60 ampères/dm². The

breaking test was carried out at a constant velocity of ex-Card 1/3

The Influence of the Polarization of Steel on Its Mechanical Properties

SOV/20-120-4-38/67

tension of V = 2 mm/min, and the current was applied simultaneously with the starting up of the tensile-testing machine. The soft annealed steel-3 on the occasion of its stretching in air had a distinct flow surface, a considerable elongation, a lateral constriction, and even flow figures. The same phenomena were observed on the occasion of the stretching samples with the same velocity in an electrolyte without polarization by an external power supply and also in an electrolyte with anodic polarization of the stretched sample. A brittle destruction existed in cathodically polarized samples mainly along the planes of the maximum tangential tensions (along the flow figures). On the occasion of the cathodic polarization of the samples the indices of plasticity δ_{10} and ψ and the actual breaking tension decreased in a particularly high degree. Anodic polarization has no influence on the mechanical properties of steel. The phenomena in cathodic polarization are apparently due to hydroden occlusion (navodorazhivaniye) which the stretched steel samples brittle. There are 3 figures and 1

Card 2/3

table.

The Influence of the Polarization of Steel on Its Mechanical Properties

507/20-120-4-38/67

ASSOCIATION:

Institut mashinovedeniya i avtomatiki Akademii nauk USSR (Institute of Mechanical Engineering/Automation AS UkrSSR)

PRESENTED:

January 24, 1958, by P. A. Rebinder, Member, Academy of

Sciences, USSR

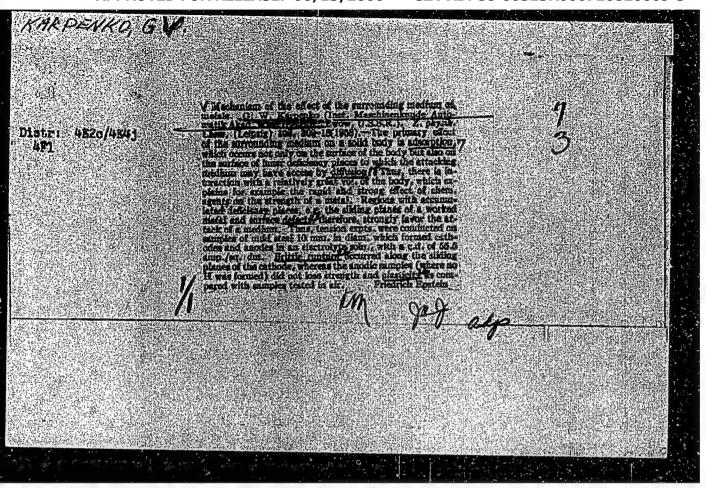
SUBMITTED:

January 23, 1958

1. Steel--Mechanical properties 2. Steel--Polarization

3. Polarization--Metallurgical effects

Card 3/3



KARPENKO, G.V.

PHASE I BOOK EXPLOITATION SOV/3631

Karpenko, Heorhyy Vladymyrovych

Koroziyna vtoma stali (Corrosion Fatigue of Steel) Kyyiv, Vyd-vo AN URSR, 1959. 175 p. Errata slip inserted. 1,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrayins'koyi RSR. Instytut mashynoznavstva i avtomatyky.

Resp. Ed.: I.I. Ishchenko, Candidate of Technical Sciences; Ed. of Publishing House: I.V. Kisina; Tech. Ed.: M.I. Yefimova.

PURPOSE: This book is intended for engineers and scientists working in the field of chemical machinery building and also for operators of machines and equipment at chemical plants.

COVERAGE: The book discusses the phenomenon of brittle fracture in steal due to the long-time action of corrosive environment and static or cyclic stresses. On the basis of the adsorption electrochemical theory of corrosion fatigue a new explanation of brittle fracture in steel is presented. The book is based on investigations made by the author and his coworkers. Corrosion fatigue Card 1/4

SOV/3631 Corrosion Fatigue of Steel phenomena are discussed in the light of the theory of physicochemical mechanics of metals. Acknowledgements are made to A.I. Yatsyuk and V.T. Stepurenko for the use of their materials in preparing the book. There are 157 references: 113 Soviet, 24 English, 17 German, and 3 French. TABLE OF CONTENTS: 3 Foreword Introduction 8 I. Environment and Its Properties . 1. Classification of media according to their effect on the strength 8 and resistance of steels 9 2. Corrosive media 19 II. Steel and Its Properties 19 1. On the structure of steel. 2. Physicochemical properties of steel significantly affecting 26 its interaction with the environment Card 2/4

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25(1); 18(7)

PHASE I BOOK EXPLOITATION

SOV/2426

Karpenko, Georgiy Vladimirovich, Doctor of Technical Sciences, Professor

Vliyaniye mekhanicheskoy obrabotki na prochnost' i vynoslivost' stali (Effect of Machining on the Strength and Fatigue Resistance of Steel) Moscow, Mashgiz, 1959. 184 p. 5,000 copies printed.

Reviewer: V. I. Likhtman, Doctor of Physical and Mathematical Sciences, Professor; Ed. of Publishing House: P.Ya. Furer; Chief Ed. (Southern Division, Mashgiz): V.K. Serdyuk, Engineer.

FURPOSE: This book is intended for engineers, technicians, and scientists working in the field of machine manufacturing.

COVERAGE: The book presents basic information on the strength and fatigue resistance of steel, and methods of testing for these characteristics under the action of various external media. In addition, the author discusses how, in the presence of these media, the strength and fatigue resistance of steel are affected by the condition of the surface and subsurface layers and by changes resulting from machining (turning, grinding, burnishing). S. V. Serensen,

Card 1/4

Effect of Machining on the Strength (Cont.)

SOV/2426

I. A. Oding, and Ye.M. Shevandin are mentioned in connection with their studies of the effect of machining on fatigue strength, in particular, the effect of microgeometry and the state of the subsurface layer. Personalities mentioned for contributions in related fields are: P.Ye. D'yachenko, A.I. Isayev, V.A. Krivoukhov, L.A. Glikman, B.I. Kostetskiy, A.A. Matalin, and M.O. Yakobson. There are 157 references: 119 are Soviet, 20 German, and 18 English.

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S/137/61/000/011/076/123 A060/A101

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AUTHOR: Karpenko, G.V.

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On the problem of the crushing mechanism of stressed metal under

the action of molten metal

PERIODICAL:

TITLE:

Referativnyy zhurnal. Metallurgiya, no.11, 1961, 36, abstract 11Zh218 ("Byul. In-t metallokeram. i spets. splavov AN USSR", 1959,

no. 4, 79 - 85)

TEXT: The author discusses the results of experiments carried out for the rurpose of clarifying the action of molten metal upon the strength characteristics of metal in the solid state. A diffusion hypothesis is developed for the crushing of stressed metal under the action of molten metal, complemented by considerations of the absorption effect and of the interaction of the molten metal with large volumes of the stressed metal through defects in the latter. On the basis of experimental results it is concluded that the lowering of the ductility, strength, and endurance of the metal under the action of a surface-active, corroding medium, or a medium diffusing into the metal lattice, proceeds only in the case of interaction of that medium with a considerable volume of the metal. This is possible

Card 1/2

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50V/126-8-1-13/25

AUTHORS: Karpenko, G. V. and Kripyakevich, R. I.

TITLE: Effect of Hydrogen Diffusion, Occurring During Deformation of Steel, on the Mechanical Properties of the Latter

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 1, pp 90-94 (USSR)

ABSTRACT: A special attachment to the tensile testing machine IM-12 (Fig 1) enabled a steel specimen to be fractured in an electrolyte during application of a cathodic or anodic potential from an external source of current. This attachment also enabled the mechanical properties of the steel and the kinetics of the hydrogen diffusion to be determined when the elongated specimen was made the cathode, and it was possible to change the anode material as well as the composition of the electrolyte and the current density. Finally this attachment enabled steel specimens to be studied during their anode polarization. In order to be able to observe the decrease in plasticity the experiments were carried out with the soft annealed steel St.3 having a pearlite-ferrite structure. Specimens of 10 mm diameter and a working portion length of 100 mm, Card 1/4 were washed with aviation benzene and desorbed with

66855 SOV/126-d-1-13/25

Effect of Hydrogen Diffusion, Occurring During Deformation of Steel, on the Mechanical Properties of the Latter

activated carbon prior to testing. Soft steel St.3, lead, copper and graphite were used as anode material. An aqueous 26% sulphuric acid solution (s.g. 1.18) and an 18% aqueous solution of caustic soda were used as the electrolytes. The current density changed due to polarization from $0\text{--}60~\text{amps/dm}^2$. Tests were carried out at a constant rate of v = 2 mm/min. The current was switched on and the tensile testing machine was started simultaneously. The electrolyte was poured in immediately before the beginning of the test (an average of 4 min passed between the beginning of the electrolyte pouring and the beginning of the test). The entire test lasted from 10-15 min. The aim of the test was to determine the UTS ($\sigma_{\rm UTS}$, kg/mm²), the yield stress ($\sigma_{\rm yield}$, kg/mm²), the true stress during fracture ($\sigma_{\rm true}$, kg/mm²); percentage elongation ($\delta_{10\%}$) and the percentage reduction in area (ψ %) of the steel during the polarization process. In Fig 2 the influence of polarization of steel St.3 on Card 2/4 the nature of the stress-strain curves is shown; a - in

66835 SOV/126-8-1-13/25

Effect of Hydrogen Diffusion, Occurring During Deformation on Steel, on the Mechanical Properties of the Latter

> air, 6 - during anodic polarization, v, g, d - during cathodic polarization. The anode material was iron, Fig 3 shows specimens of steel St.3 fractured under various conditions: a - in air, b - during anodic polarization and B - during cathodic polarization. In Fig 4 the dependence of w on current density is shown: a - copper anode, acid electrolyte; b - lead anode, acid electrolyte; B ~ iron anode, acid electrolyte; ? - graphite anode, acid electrolyte and d - lead anode, alkaline electrolyte. The table on p 92 gives mechanical properties of steel St. 316 as determined by tests carried out in air and in an electrolyte at the optimum current density at which the greatest changes in mechanical properties of the steel were observed. The authors arrive at the following conclusions: 1) The influence of hydrogen on soft steel during its deformation by straining consists in decreasing the plasticity, ψ and δ , and the true stress on fracturing σ_{true} . The UTS and yield stress do not change.

Card 3/4 otrue.

66895

 $$50V/126-8\cdot\cdot1-13/25$ Effect of Hydrogen Diffusion, Occurring During Deformation on Steel, on the Mechanical Properties of the Latter

- 2) The effect of the influence of hydrogen on the above mechanical properties of steel depends on the current density, and it becomes evident at certain optimum current density values.
- 3) The fracture of cathodically polarized specimens during elongation is brittle in nature and occurs essentially along planes of maximum tangential stresses (along slip lines).

 There are 4 figures, 1 table and 4 references, 3 of

which are Soviet and 1 French.

ASSOCIATION: Institut mashinovedeniya i avtomatiki AN UkrSSR (Institute of Machine Construction and Automation, Ac.Sc., UkrSSR)

SUBMITTED: June 13, 1957

Card 4/4

PHASE I BOOK EXPLOITATION

sov/5239

Karpenko, Georhyy Volodymyrovych

Vplyv vodnyu na mekhanichni vlastyvosti stali (Influence of Hydrogen on the Mechanical Properties of Steel) Kyyiv, Vydavnytstvo AN Ukr. RSR, 1960. 69 p. 1,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrayins'koyi RSR. Instytut mashy-noznavstva i avtomatyky.

Resp. Ed.: R. I. Kryp'yakevych, Candidate of Technical Sciences; Ed. of Publishing House: I. V. Kisina; Tech. Ed.: 0. 0. Kadashevych.

PURPOSE: This booklet is intended for engineers and scientific workers in the field of chemical machine building.

COVERAGE: The effect of hydrogen on the mechanical properties of steel is discussed from the standpoint of the physicochemical treatment of materials and the theory of dislocation. The author presents a new interpretation of the mechanism of hydrogen

Card 1/4

S/021/60/000/006/012/019 A153/A029

AUTHORS:

Karpenko, G.V.; Stepurenko, V.T.

THILE:

The Influence of Hydrogen Sulfide on the Plasticity of Steel

PERIODICAL: Dopovidi Akademiyi nauk Ukrayins koyi RSR, 1960, Nr. 6, pp. 791 - 794

TEXT: A study was made to find out the primary causes of the intensive corrosion and the decrease of the plasticity of steels. Teither due to the anodic processes or the cathodic processes occurring in steels subjected to the effects of humid hydrogen sulfides or aqueous solutions of H₂S. A theoretical explanation of the essence of the above processes is given. It is stated that water saturated with hydrogen sulfide decreases the plasticity of steel not because of anodic processes (formation of a rust layer), but owing to cathodic processes, which produce a hydrogenation of steel. Hydrogen desorption almost fully restores the plastic properties of steel. Cathodic steel polarization in water containing hydrogen sulfide considerably increases the loss of the plasticity of steel.

Anodic polarization retains the initial plasticity of steel in hydrogen sulfide

Card 1/2

S/021/60/000/006/012/019 A153/A029

The Influence of Hydrogen Sulfide on the Plasticity of Steel

water. Two mm wires made of Y-7 $(U-7)^{1/5}$ steel, containing 0.65% C, 0.4% Mn. 0.22% S were investigated. Figure 1 shows the dependence of the plasticity of steel on the concentration of H₂S and the time of submersion in hydrogen sulfide solution. There are 4 figures.

ASSOCIATION: Instytut mashynoznavstva i avtomatyky AN UkrSSR (Institute of the

Science of Machines and Automation of the AS UkrSSR)

PRESENTED: by Yu.K. Delimars'kyy, Academician, AS UkrSSR

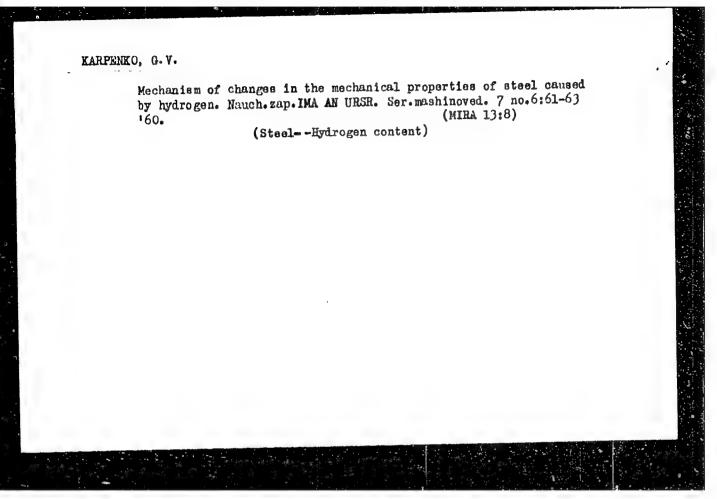
SUBMITTED: December 17, 1959

Card 2/2

KARPENKO, G.V. [Karpenko, H.V.] (L'vov)

New ideas on the effect on hydrogen on properties of steel. Prykl.mekh. 6 no.4:361-367 60. (MIRA 13:11)

1. Institut mashinovdeniya i avtomatiki AN USSR. (Steel-Hydrogen content)



KARPENKO, G.V., STEPURENKO, V.T.

Effect of the nature of a corrosion medium on corrosion and corrosion-fatigue resistance of steel. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.6:64-69 '60. (MIRA 13:8) (Steel--Corrosion)

S/032/60/026/009/010/018 B015/B058

AUTHOR:

Karpenko, G. V.

TITLE:

Influence of the Working Medium on the Appearance of the

Scale Effect

PERIODICAL:

Zavodskaya laboratoriya, 1960, Vol. 26, No. 9,

pp. 1134 - 1135

TEXT: As far back as 1953 (Ref. 1), the author showed that in bending experiments on samples of 20X (20Kh) steel with a perlite-ferrite structure, in a corrosive medium such as water, the scale effect is inverse to that obtained with experiments in the air. Experiments conducted in the air, in oleic acid-containing oil and river water showed (Fig., diagrams of the dependence of the scale-effect coefficient on the sample diameter) that with an increase of the sample diameter, the durability of the sample decreases in the air, while it increases in water and also decreases in activated oil, but much more slowly than in the air. Since these results contradict those by McAdam (Ref. 3), L. A. Glikman et al (Ref. 4) experimentally checked the results by the author and McAdam

Card 1/3

Influence of the Working Medium on the Appearance of the Scale Effect

S/032/60/026/009/010/018 B015/B058

and established that the contradiction must be explained by the duration of the test, i.e., that an inversion of the scale effect occurs with regard to experiments in the air on a sufficiently prolonged action of the corrosion medium. This phenomenon is explained by the author by varying effects on the layer below the metal surface, i.e., a corrosive medium weakens this layer, the weakening being relatively greater for samples with small diameter than for those with a large diameter. Consequently, the fatigue limit increases with an increase of the sample size. Every factor leading to a reduction of the faultiness of the metal layer mentioned, is bound to favor the appearance of the scale effect. Since the weakening of the metal layer in the surface-active oil medium was considerably smaller than in water, the appearance of the scale effect could not be completely eliminated, but it was weakened. For media in which durability increases, it may be expected that a scale effect appears in the case of a technical treatment, where a strengthening of the layers below the metal surface is achieved. There are 1 figure and 4 references: 3 Soviet and 1 US.

Card 2/3

KARPENKO, G.V., otv. red.; LEONOV, M.Ya., doktor fiz.-mat. nauk, zam. otv. red.; KRIPYAKEVICH, R.I., kand. tekhn. nauk, red.; MAKSIMOVICH, G.G., kand. tekhn. nauk, red.; PANASYUK, V.V., kand. fiz.-mat. nauk, red.; PODSTRIGACH, Ya.S., kand. fiz.-mat. nauk, red.; STEPURENKO, V.T., kand. tekhn. nauk, red.; TYNNYY, A.A., kand. tekhn. nauk, red.; CHAYEVSKIY, M.I., kand. tekhn. nauk, red.; YAREMA, S.Ya., kand. tekhn. nauk, red.; REMENNIK, T.K., red. izd-va; LISOVETS, A.M., tekhn. red.

[Machines and devices for testing metals] Mashiny i pribory dlia ispytanii metallov. Kiev, Izd-vo Akad.nauk USSR, 1961. 132 p. (MIRA 15:2)

1. Akademiya nauk URSR, Kiev. Instytut mashinoznavstva i avtomatyky. 2. Chlen-korrespondent Akad. nauk USSR(for Karpenko).

(Testing machines)

\$/735/61/000/000/001/014

AUTHOR: Karpenko, G. V.

TITLE: Fundamentals of endurance and fatigue testing of metals in active media.

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut mashinovedeniya i avtomatiki.

Mashiny i pribory dlya ispytaniy metallov. Kiyev, 1961, 5-10.

Specific considerations are expounded concerning the effect of the sur-TEXT: rounding medium by corrosion, diffusion, radiation, erosion, or cavitation on both the static endurance and the cyclic fatigue strength of solid bodies. Media which effect a significant lowering of the level of surface energy by adsorption may act rapidly, e.g., through a lowering of the plasticity of a metal tested at rates of deformation of mm/min (cf., e.g., Labzin, V.A., Likhtman, V.I., Akad.n. SSSR, Dokl., v. 129, no. 3, 1959; Kosogovo, G. F., Likhtman, V. I., ibid., v. 134, no. 1, 1960). Fast-acting media contain H, the active form of which, proton gas, acts so swiftly that only in exceedingly rapid processes, such as impacts, is the strength of the material tested not affected thereby (cf. Karpenko, G. V., Vplyv vodnyu na mekhanichni vlastivosti stali - The effect of water on the mechanical properties of steel, Vyd-vo AN URSR, 1960). Thus, some effect of the external medium is always experienced in static endurance and cyclic fatigue tests. This effect is ordinarily a weakening one (cf. Karpenko, G. V., Vliyaniye aktivnykh zhidkikh sred na vynoslivost! stali - The effect of active fluid media on the strength of steel. Moscow. Mashgiz, 1955); liquid Sn and its toughening effect on cyclically-tested steel is an example of the opposite effect Card 1/3

Fundamentals of endurance and fatigue testing...

\$/735/61/000/000/001/014

(cf. Chayevskiy, M.I., Akad.n. SSSR, Dokl., v. 129, no. 5, 1959). In martensite-like nonequilibrium structures corrosional media may lower the fatigue limit by tens of times. Erosion- and cavitation-active media impair fatigue strength usually by the creation of stress-concentrators. Neutron-radiating media may increase the fatigue strength over the short term, but lower it in the long run. Media that dissolve the structural material weaken it usually, e.g., in the action of some liquidmetal fusions on ferritic alloys. Media that form compounds with the structural material may strengthen or weaken it thereby, but even if the ultimate product is weaker than the initial material, the formation in the surficial layer of residual compressive stresses may produce a net strengthening effect; example: The effect of liquid metallic Sn or the Pb-Sn eutectic on steel (cf. Chayevskiy, M.I., Akad.n. SSSR, Dokl., v. 134, no. 6, 1960). To establish order among the many seemingly contradictory physical, physico-chemical, electrochemical and other effects, certain basic media and materials factors can be identified. Adsorption, preceding corrosion and diffusion phenomena, is a universal factor. Adsorption of surface-active elements lowers the surface energy of a solld and weakens it, at times to the point of reducing the metal to colloidal particles, as is observed in tests with Zn single crystals covered with liquid Ga (Shchukin, Ye.D., et al., Kristallografiya, v. 4, no. 6, 1959). Some weakly surface-active media, however, may even strengthen a metal (cf. Maksimov, G.G., et al., in Sbornik "Voprosy mashinovedeniya i prochnosti v mashinostroyenii, "no.7, 1961). Adsorption effects occurring at the interface Card 2/3

Fundamentals of endurance and fatigue testing... S/735/61/000/000/001/014

between the metallic body and the medium soon penetrate through surface defects and by diffusion along the inner interfaces of the surface-active phases dissolved in the solid. The result is "adsorption fatigue" (Karpenko, G. V., Prikladnaya mekhanika, v. 3, no. 1, 1957). Another universal factor affecting the interaction of cyclically stressed materials with surrounding media is the presence of a variety of statistically distributed defects (from ultramicroscopic to macroscopic), including dislocations and vacancies, variations in surface-tension gradients, etc.; the Rebinder effect is cited (Rebinder, P.A., Zeits.f. Phys., v. 72, 1931, 191, and in Yubilneynyy sbornik, posvyashchennyy Oktyabr'skoy revolyutsii, Izd-vo AN SSSR, v. 1, 1947, 123). The activation of a solid body under deformation, which reduces the activation increment required of the external medium to produce a weakening effect. Uneven action by the medium due to uneven deformative activation of the metal facilitates the weakening effects; hence, the pre-test treatment of the specimen may have a decisive effect on its fatigue strength. The "inherited" effects of machining, etc., may facilitate the attack by an active medium; on the other hand, any cold-hardening finishing operation which suppresses the changes caused by antecedent cutting operations, will exert a protective effect. There are 19 Soviet references, of which 18 are Russian-language and I German-language.

ASSOCIATION: None given.

Card 3/3

5/723/61/000/001/001/005

AMTHORS: Karpenko, G. V., Kripyakevich, R. I.

TITLE: Modern concepts on the effect of H on the properties of steel.

SOURCE: Vliyaniye rabochikh sred na svoystva stali. vyp. 1: Sredy,

vyzyvayushchiye navodorozhivaniye stali. In-t mash, i avtom. AN

UkrSSR. Kiyev, Izd-vo AN UkrSSR, 1961, 5-21.

TEXT: The paper sets forth the extant basic theories on the effect of H on the properties of a steel, together with a critique and a presentation of the authors' concepts on this problem. The existing theories of hydrogen-embrittlement can be divided into 3 groups, each of which has a number of ramifications. (1) The H-molecular pressure theory, including (a) the theory of the areal pressure, (b) the diffusion theory, (c) the energetic theory, (d) the theory of reversible and irreversible brittle-news; (2) the adsorption theories; (3) the theory of the maximal triaxial stresses. The first concepts are discussed in the light of the Zapffe-Sims theory, the Cottrell-Barrett concepts, the Bastien-Azou concepts, the DeKazinczy theory, the Soviet Concepts and others. The critique of the pressure theory follows 2 lines: On the one hand, the position taken by the originators of that theory disregards the effect of diffusion processes on the mechanism of H-embrittlement and attempts to attribute it strictly to the pressure in the collectors. On the other hand, it can be Card 1/2

Modern concepts on the effect of H on the

8/723/61/000/001/001/005

reasoned that, according to the combined pressure and diffusion theories, the pressure of the molecular H in the collectors must evoke, firstly, a decrease in tensile strength and, secondly, a decrease in plasticity of the steel. By vector analysis it can be shown that a reduction in plasticity alone can reduce the external force required for tensile fracture. However, the reduction in plasticity of the steel cannot be attributed solely to the action of the internal pressure in the collectors. A survey of this line of criticism is set forth. A further review of the other theories of Hembrittlement follows, utilizing primarily Western sources. Following a presentation of the theory of the mechanism of the reversible and irreversible H-embrittlement, it is stated that experiments performed by the junior author (see Abstract S/723/61/000/001/002/005) confirm that theory. The intensification of the Hembrittlement effect in steel, under conditions of hydrogenation during the process of deformation of a specimen, is attributed to the more economical utilization in that process of the available H than in the case of a deformation following an antecedent hydrogenation. Crack formation is achieved by a negligible amount of H in the near-surficial specimen layer. As the specimen is further stretched, the H that is supplied to the specimen continuously from the environment succeeds in diffusing toward the root of the crack and thereby facilitates its further development. Further reasonings in favor of the reversible-irreversible-H-embrittlement are adduced. There are 5 figures and 37 references (15 Russian-language Soviet, 18 Englishlanguage, 3 French, 1 German). Qard 2/2

\$/735/61/000/000/003/014

AUTHORS: Chayevskiy, M.I., Popovich, V. V., Karpenko, G.V.

TITLE: A machine for the investigation of elastic-plastic torsional deformations.

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut mashinovedeniya i avtomatiki.

Mashiny i pribory dlya ispytaniy metallov. Kiyev, 1961, 19-25.

TEXT: The design of a machine for torsional testing of steel specimens at high temperatures (T), in contact with various fluid media, and with large cyclic deformations, is described. Test data for normalized steel "50" at room temperature are adduced. The machine was developed to provide an experimental means for a determination of whether or not to include cyclically alternating torsional-stress conditions implying elastic-plastic deformation as reasonable design conditions for certain power-plant elements, such as tubes and boilers, which may undergo a relatively small number of such cycles in their operational life span. The vertically oriented specimen is clamped rigidly at its lower end. The upper, rotatable, straingage-dynamometer clamp is twisted by a 0.6-kw, 1410 rpm, reversible electric motor via a two-stage $1:30 \times 1:64 = 1:1920$ worm-gear train (angular rate - 4.6 rad/min). The angular travel of the clamp is measured by a rheochord. The motor-reversal switch is actuated by travel-limiting stops for fixed-deformation tests and

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A machine for the investigation of elastic-plastic... S/735/61/000/000/003/014

by strain-gage signals for fixed-torque tests (the strain gages are water-cooled to avoid temperature effects). The signals issuing from the rheochord and the strain gages are recorded by a coordinate recorder for the purpose of tracing the hysteresis loop (cf. Chayevskiy, M.I., in Zbornik "Temperaturni napruzhyennya v tonkostinnykh konstruktsiyakh - T stresses in thin-walled structures." Vyd-vo AN URSR, 1959). During fixed-torque tests the signals issuing from the strain gages are fed into a bridge circuit, the unbalance of which energizes a reversible PII-9 (RD-9) motor which drives both a balancing rheostat and a switch-actuating cam; vernier adjustments are available for enhanced precision, with reference to the extreme points of the recorded graph. A multisection resistance heater with 3-mm-dia NiCr wire coils maintains a T to within ± 1°C along the specimen with the aid of an 3NB-01 (EPV-01) potentiometer. A metal container embracing the specimen is used for tests in a fluid medium. A sample recording of a room-temperature test in air of a normalized steel-50 specimen shows that the first complete cycle results in a toughening of the metal and that subsequent cycles are practically stable, but are affected by some stress asymmetry. A summary graph for the same test shows the number of cycles to failure as a function of (1) the angle-of-twist amplitude and (2) the maximal tangential stresses, also (3) the plastic-deformation work A (kg/cm) as a function of the maximum tangential stress T (g/cm²). The latter curve is well approximated by A = (1/3) • 10-0 76. There are 3 figures and 1 Ukrainian-language ASSOCIATION: None given. Card 2/2 Soviet reference.

5/723/61/000/001/003/005

AUTHORS: Karpenko, G. V., Stepurenko, V. P.

TITLE: The effect of hydrogen-sulfide water on the mechanical properties of

steel.

SOURCE: Vliyaniye rabochikh sred na svoystva stali. vyp.1: Sredy, vyzyvahush-

chiye navodorozhivaniye stali. În-t mash. i avtom. AN UkrSSR.

Kiyev, Izd-vo AN UkrSSR, 1961, 27-33.

TEXT: The paper reports experimental tests which show that the impairment of the mechanical properties of a steel during short-term soaking in H₂S water is attributable to hydrogenation and not to corrosion. Description of the H restores/the initial mechanical properties of the steel almost fully. The investigation was performed on low- and medium-C steels in the form of 1-mm-diam wire (0.07%)C, 0.47% Mn, 0.04% S, 0.007% P) and 2-mm-diam wire (0.67% C, 0.44% Mn, 0.029% S, 0.019% P). The wire specimens were degreased and immersed into water containing various amounts of H₂S. Escape of the H₂S during the immersion process was impeded by a 20-mm-thick oil layer floating atop the water. Following immersion for differing periods of time, bending and torsion tests were made on some of the specimens, while other specimens were subjected to drying for the purpose of aging,

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followed by desorption of the H which had penetrated the steel by means of cathode processes in the H2S water. The second group of specimens was then also tested for bending and torsion after a prescribed holding time in the drier at differing temperatures. The results of the tests are shown in the form of graphs of the flexural plasticity of the wire vs. time, for different flexural and torsional plasticity of the wire vs. time, for different H2S concentrations, and it was found that: (1) Both the anodic and the cathodic process affect the mechanical properties of steels immersed in H2S water; however, during short-term exposure of the specimens the impairment of the plastic properties occurs through hydrogenation of the cathodic regions only; (2) the losses in plasticity (the decrease in the number of flexural and torsional strains) of the steel specimens after immersion in the H2S water increases with increasing concentration and with increasing exposure time of the speciment to the medium; (3) the effect of the H2S water is more pronounced in the torsional tests than in the flexural tests; (4) desorption of the H restores the plastic properties of the steel almost fully; the higher the aging temperature, the faster the plasticity is restored. There are 7 figures and 2 references (1 Russian-language Soviet and 1 French-language original by Bastien-Amiot in Russian translation).

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KARPENKO, G.V.; STEPURENKO, V.T.

Effect of polarization on the plasticity of steel. Vliian.rab. sred.na svois.stali no.1:34-38 '61. (MIRA 15:5) (Steel—Corrosion) (Polarization (Electricity))

KARPENKO. G.V.; STEPURENKO. V.T.

Effect of preliminary hydrogen absorption on the corrosion resistance of steel. Vliian.rab.sred.na svois.stali no.1:39-44
161. (MIRA 15:5)

(Steel-Hydrogen content) (Steel-Corrosion)

\$/735/61/000/000/005/014

AUTHORS: Maksimovich, G.G., Yanchishin, F.P., Popovich, V.V., Nagirnyy, S.V.,

Karpenko, G. V.

TITLE: Machines for micromechanical endurance testing under variable tension

in various media.

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut mashinovedeniya i avtomatiki.

Mashiny i pribory dlya ispytaniy metallov. Kiyev, 1961, 41-46.

TEXT: A machine is described in which inertial loading is used in the endurance testing of 1- to 3-mm dia microspecimens in various fluid media. Variable-tension testing methods are described, and test data reported on 1-mm dia steel-45 microspecimens in air, MC (MS) oil activated with 2% oleic acid, and a 3% watery solution of NaCl. Testing of microspecimens is attractive for the determination of the effect of environmental media on the static and cyclic fatigue strength of a material; in smaller specimens the ratio of the surface area to the cross-sectional area is greater than in large specimens. Testing machines for static microspecimen tests have been described elsewhere (cf. Roytman, I.M., Fridman, Ya.B. Mikromekhanicheskiy metod ispytaniya metallov - The micromechanical method of metals testing. Moscow. Oborongiz, 1950. Konoplenko, V.P., et al., Zavodskaya laboratoriya, v.25, no. 1, 1959. Regel; V.R., et al., ibid.). Variable-load testing is well known for large specimens, but little has been done for the testing of 1- to 3-mm dia microspecimens because of the difficulties inherent in the over-all precision and especially the exact Card 1/3

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centering required. In the authors! machine the specimen (surrounded by a beaker for tests in various fluid media) is suspended from an annular dynamometric holder equipped with surface wire strain gages. A prescribed weight, spring-suspended from the lower end of the specimen, constitutes the static tension load. Also suspended from the lower end of the specimen is a floating frame containing an eccentric weight which is flexible-shaft-driven by a 30-w d.c. motor at 3,000 to 10,000 rpm. A spring parallelogram attached to the vertical machine support absorbs any horizontal component of the vibration, and only the vertical component of the cyclic inertial load is borne by the specimen. A variable resistance in the feed circuit permits programmed variations in the inertial load. The strain-gage readings are taken on an MNO-2 (MPO-2) oscillograph. The annular dynamometer is precalibrated statically. The strain-gage signals are preamplified on a tensometric TY = 6M (TU-6M) amplifier. All tests were made in tension only, the mean load (equal to the static load) was held constant or varied, and the inertial-load amplitude was held constant or varied. Test data on carbon steel "45" are reported. The static (or mean) tension was $\sigma_m = 29.3 \text{ kg/mm}^2$, the inertial load, with a frequency of 50 and 142 cps, was varied. Fatigue curves are shown. The fatigue limit at high stresses is found to be greater in fluid media than in air. At the 142-cps frequency the fatigue limit in air and in activated oil is attained at 2.5 · 10 cycles. There is no noticeabl effect of the activated oil on the fatigue limit on the basis of 108

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cycles. The NaCl solution produced a continuous impairment of the fatigue limit. At 50 cps an analogous behavior is observed. The endurance limit in air and in activated oil is attained at 8.5 · 10 cycles. NaCl reduces the fatigue limit continuously. There are 3 figures and 6 Russian-language Soviet references.

ASSOCIATION: None given.

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5/723/61/000/001/005/005

AUTHORS: Karpenko, G. V., Babey, Yu. I., Kripyakevich, R. I.

TITLE: On hydrogen fatigue of steel under cathodic protection.

SOURCE: Vliyaniye rabochikh sred na svoystva stali. vyp. 1: Sredy, vyzyvaýushchiye navodorozhivaniye stali. In-t mash. i aytom., AN UkrSSR, kjyev.

Izd-vo AN UkrSSR, 1961, 59-64.

TEXT: An experimental investigation has shown that under cathodic protection of cyclically stressed steel parts their endurance is impaired because of the action of electrolytically penetrated H (the "H fatigue of steel"). It is established that this phenomenon is intensified with an increase in the current density of the cathodic polarization. When the current density is small, anodic corrosion processes accur. The development of H fatigue is impeded if the electrolyte is not sufficiently attreed, owing to the formation of an alcaline zone. A special equipment was constructed (cross-section shown) for the fatigue testing of a metal under simultaneous hydrogenation. This equipment was used in conjunction with the IMA-30 testing machine; it was constructed by the Institute of Machine Science and Automatics, AS UKASSR, and was capable of testing 10-30-mm diam specimens by pure cyclic flexure thring rotation. The specimens actually used had 20-mm diam in their working position. They were made of steel 45 (0.45% C, 0.65% Mn, 0.34% Si, 0.035% S, 0.021% P. Card 1/2

On hydrogen fatigue of steel under cathodic

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0.03% Ni, 0.05% Cr, $\sigma_h = 70 \text{ kg/mm}^2$, $H_B = 207$). The corrosive medium tested was a 3% solution of NaCl in faucet water, which, to a degree, simulates sea water. The specimen served as the cathode, and a Pt anode was employed. The electrolyte was introduced under a small pressure, so that the working part of the specimen was fully immersed. Polarization was achieved through a rectifier and a rheostat, which provided a current density ranging from 0.007 to 6.2 amp/dm². The tests in air were performed on a basis of 10⁷ cycles and in the corrosive medium, at 2.10⁷ cycles. The values of the fatigue limit vs. the cathode current density are graphed, together with fatigue limit vs. the number of cycles, with the current density as a parameter. It was noted that there is an optimal current density (0.15 amp/dm2 for the conditions of the present investigation), at which the anodic process comes to a total standstill and the fatigue strength attains a maximal value, which however is still 10% lower than in air, a phenomenon that is attributed to H fatigue. It is concluded that, in any stress analysis of parts that may have to operate under conditions similar to those tested, the effect of H fatigue should be taken into account, together with the specific conditions of the electrolyte exchange that may occur in the respective practical case. There are 3 figures and 6 references (5 Russianlanguage Soviet and 1 English-language: Evans, U.S., Metallic corrosion, passivity, and protection, 2d ed., London, Edward Arnold, 1946, in Russian translation).

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Effect of hydrogen on the microhardness of structural components in low-carbon steel. Viiian.rab.sred.na svois.stali no.1:73-79
'61. (Steel—Hydrogen content) (Hardness)